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KATTEN MUCHIN ZAVIS ROSENMAN
575 Madison Avenue
New York, NY 10022-2585

EXAMINER

LAMARRE, GUY J

ART UNIT

PAPER NUMBER

2133

DATE MAILED: 07/14/2003

22

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/301,853

Applicant(s)

OHBUCHI ET AL.

Examiner

Guy J. Lamarre, P.E.

Art Unit

2133

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 26 June 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-53 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-53 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☒ The proposed drawing correction filed on 08 November 2002 is: a) ☒ approved b) ☐ disapproved by the Examiner
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ 6) ☐ Other: _____

DETAILED ACTION

Response to Amendment

0. Applicant's amendment along with the petition for 3-month extension of time of 26 June 2003, and address change of 27 November 2002, have been entered. The petition of 3-month extension of time has been granted.. This office action is in response to Applicants' amendment.

0.1 Claims 47-48 are amended. Claims 1-53 remain pending.

0.2 The rejection under 35 USC 112 and objections of record are withdrawn in response to instant Applicants' amendment.

0.3 The rejections to Claims 1-53 under 35 USC 103(a) of record are maintained in response to instant Applicants' amendment.

0.4 The Examiner gratefully acknowledges Applicants' cooperation in trying to expedite prosecution of instant application on 8 July 2003.

Response to Arguments

0.5 Applicants' arguments of 26 June 2003 *along with the entire disclosure* have been fully considered, but are not found persuasive.

It is not clear to the examiner where the invention is claimed: data permutation implies interleaving according to some predetermined order. Thus the claimed invention reads on the prior art of record. The submitted permutation illustrations are not part of the claims. It is also clear to those of ordinary skill in the art of data communication how to interleave/manipulate data for burst error protection.

Claim Rejections - 35 USC § 101

1. 35 U.S.C. 101 reads as follows:

Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

Art Unit: 2133

1.1 Claims 1-2 are rejected under 35 U.S.C. 101 as claiming a mathematical formula or algorithm. Applicant is advised to modify limitations of said claims as being incorporated or embedded in hardware or readable machine medium.

Claim Rejections - 35 USC ' 103

2. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103© and potential 35 U.S.C. 102(f) or (g) prior art under 35 U.S.C. 103(a).

2.0 The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2.1 **Claims 1-53** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Applicants' Admitted prior art** (hereinafter **Admitted prior art**) in view of **Lin et al.** (US Patent No. 5,068,878; February 6, 1990).

As per Claims 1, 2, 3, 10, 17-24, 31-32, 35-36, 43, 46 and 49, Admitted prior art substantially discloses the procedure for the claimed interleaving means (or reverse operation) comprising the steps of: arranging data to be transmitted in a matrix; and rearranging or spreading by interchanging rows of the matrix according to a predetermined order, each row representing a set of data pieces of said data and rearranging or spreading by interchanging columns of the matrix according to a predetermined order, each column representing a set of data pieces of said data; and outputting said rearranged data in time series. {See **Admitted prior art**, Figs. 22-24, and page 1 line 17 – page 8 line 5, in passim, wherein rearranging or spreading means are described, e.g. data is acquired, stored or arranged in matrix or array form,

Art Unit: 2133

subsequently permuted or spread row or column-wise in a random or predetermined fashion or order (Examiner notes that even though the data interleaving is effected in a random fashion, said predetermined fashion or order interleaving is known by the de-interleaver, de-interleaver that will use such knowledge to operate on interleaved data so as to recover the original data. Therefore, there is a predetermination in the order in which the interleaver arranges the original data.), and said permutation or interleaving operation being timed or synchronized via a clock; means to reverse data ordering (de-interleaving or de-spreading) to recover said data; and control means to perform data shuffling and re-ordering; means to perform error detection and correction (page 3 line 25); means for data communication or transmission via radio or antenna means (page 1 line 17).} **Not specifically described** in detail in **Admitted prior art** is the step whereby random or predetermined fashion or order of rearranging data by columns or rows is performed in time series or sequentially.

However such approach is well known. For example, **Lin et al.**, in an analogous art, discloses algorithms wherein such techniques are described. {See **Lin et al.**, Id., Abstract.} **Therefore**, it would have been obvious to a person having ordinary skill in the art at the time the invention was made to modify the procedure of the **Admitted prior art** by including therein a mathematical method as taught by **Lin et al.**, because such modification would provide the procedure disclosed in the **Admitted prior art** with a technique whereby the “[The] controller 100 then allows the flow of data from the data source 101 to continue. Referring to FIG. 3, it will be appreciated that the resynchronization signals 134, 136, 138, 140, 154 are thereby recordable on the tape 77 in a pseudo-random fashion relative to the interleave block boundaries. It will be noted that the resynchronization signals 134-154 are inserted in addition to the recorded data bytes; the flow of data being momentarily interrupted to accommodate the recording of the resynchronization signals.” {See **Lin et al.**, col. 7 line 17-et seq.}

As per Claims 4, 11, 25-26, 44-45, 47-48, 50-53, Lin et al. discloses the procedure for the claimed interleaving means, wherein said control unit comprises a write control unit for generating a write address to be used to write said data to be transmitted in said storing unit with said data to be transmitted arranged in a matrix and rearranged or spread by interchanging rows of the matrix according to a predetermined order, each row representing a set of data pieces of said data and by interchanging columns of the matrix according to a predetermined order, each column representing a set of data pieces of said data, and for writing said data to be transmitted in said storing unit, and said control unit reads said data to be transmitted stored in said first storing unit in the order of addresses. {See Lin et al., col. 5 line 67-et seq., for data writing means effected by “*controller 100 which now sequences the changeover so that RAM 96 is read out and the RAM 96' is written into, as previously mentioned (FIG. 4).*” }

As per Claims 5, 12, 27-30, Lin et al. discloses the procedure for the claimed interleaving means, wherein said write control unit comprises a column number generating unit for randomly generating column numbers and a row number generating unit for randomly generating row numbers, and said first write control unit writes said data to be transmitted in said first storing unit with numbers generated by said column number generating unit and said row number generating unit as said write address to write said data to be transmitted in said first storing unit. {See Lin et al., col. 5 line 67-et seq., for data writing means effected by “*controller 100 which now sequences the changeover so that RAM 96 is read out and the RAM 96' is written into, as previously mentioned (FIG. 4).*” } Also refer to Admitted prior art, Figs. 22-24, and page 1 line 17 – page 8 line 5, in passim, wherein apparatus and method are described, e.g. data is acquired, stored or arranged in matrix or array form, subsequently permuted row or column-wise in a random fashion, and said permutation or interleaving

Art Unit: 2133

operation being timed or synchronized via a clock; means to reverse data ordering (de-interleaving) to recover said data; and control means to perform data shuffling and re-ordering.}

As per Claims 6, 13, 39-42, Lin et al. discloses the procedure for the claimed interleaving apparatus according to claim 5(12), 2 wherein each of said column number generating unit and said row number generating unit is configured with a memory for holding numbers used as addresses in a predetermined order {See **Lin et al.** col. 6 lines 17- et seq., wherein for address generation means via counter 108.}

As per Claims 7, 14, 33-34, Lin et al. discloses the procedure for the claimed interleaving apparatus according to claim 3(10), wherein said first control unit writes said data to be transmitted in said first storing unit in the order of addresses, and said first control unit comprises a first read controlling unit for generating a read address to be used to read said data to be transmitted from said first storing unit with said data to be transmitted stored in said first storing unit arranged in a matrix and at least either columns or rows of said data to be transmitted randomly rearranged to read said data to be transmitted. {See **Lin et al.**, col. 5 line 67-et seq., for data writing means effected by “*controller 100 which now sequences the changeover so that RAM 96 is read out and the RAM 96' is written into, as previously mentioned (FIG. 4).* } Also refer to **Admitted prior art**, Figs. 22-24, and page 1 line 17 – page 8 line 5, in passim, wherein apparatus and method are described, e.g. data is acquired, stored or arranged in matrix or array form, subsequently permuted row or column-wise in a random fashion, and said permutation or interleaving operation being timed or synchronized via a clock; means to reverse data ordering (de-interleaving) to recover said data; and control means to perform data shuffling and re-ordering.}

As per Claims 8, 15, 37-38, Lin et al. discloses the procedure for the claimed interleaving apparatus according to claim 7 (14), wherein said first read control unit comprises a

Art Unit: 2133

column number generating unit for randomly generating column numbers and a row number generating unit for randomly generating row numbers, and said first read control unit reads said data to be transmitted from said first storing unit with numbers generated by said column number generating unit and said row number generating unit as said read address. {See **Lin et al.**, col. 5 line 67-et seq., for data writing means effected by “*controller 100 which now sequences the changeover so that RAM 96 is read out and the RAM 96' is written into, as previously mentioned (FIG. 4).* } Also refer to **Admitted prior art**, Figs. 22-24, and page 1 line 17 – page 8 line 5, in passim, wherein apparatus and method are described, e.g. data is acquired, stored or arranged in matrix or array form, subsequently permuted row or column-wise in a random fashion, and said permutation or interleaving operation being timed or synchronized via a clock; means to reverse data ordering (de-interleaving) to recover said data; and control means to perform data shuffling and re-ordering. }

As per **Claims 9, 16, Lin et al.** discloses the procedure for the claimed The interleaving apparatus according to claim 8(15), wherein each of said column number generating unit and said row number generating unit is configured with a memory for holding numbers used as addresses in a predetermined order {See **Lin et al.**, col. 7 lines 35- et seq., wherein predetermined order means is provided for permuting information. }

2.2 Claims 1, 2, 3, 10, 17-24, 31-32, 35-36, 43, 46 and 49 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Applicants’ Admitted prior art** (hereinafter **Admitted prior art**) in view of **Azuma et al.** (US Patent No. 4959863; June 2, 1988).

As per **Claims 1, 2, 3, 10, 17-24, 31-32, 35-36, 43, 46 and 49, Admitted prior art** substantially discloses the procedure for the claimed interleaving means (or reverse operation) comprising the steps of: arranging data to be transmitted in a matrix; and rearranging or spreading by interchanging rows of the matrix according to a predetermined order, each row representing a set of data pieces of said data and rearranging or spreading by interchanging

Art Unit: 2133

columns of the matrix according to a predetermined order, each column representing a set of data pieces of said data; and outputting said rearranged data in time series. {See **Admitted prior art**, Figs. 22-24, and page 1 line 17 – page 8 line 5, in passim, wherein rearranging or spreading means are described, e.g. data is acquired, stored or arranged in matrix or array form, subsequently permuted or spread row or column-wise in a random or predetermined fashion or order (Examiner notes that even though the data interleaving is effected in a random fashion, said predetermined fashion or order interleaving is known by the de-interleaver, de-interleaver that will use such knowledge to operate on interleaved data so as to recover the original data. Therefore, there is a predetermination in the order in which the interleaver arranges the original data.), and said permutation or interleaving operation being timed or synchronized via a clock; means to reverse data ordering (de-interleaving or de-spreading) to recover said data; and control means to perform data shuffling and re-ordering; means to perform error detection and correction (page 3 line 25); means for data communication or transmission via radio or antenna means (page 1 line 17).} **Not specifically described** in detail in **Admitted prior art** is the step whereby random or predetermined fashion or order of rearranging data by columns or rows is performed in time series or sequentially.

However such approach is well known. For example, **Azuma et al.**, in an analogous art, discloses algorithms wherein such techniques are described. {See **Azuma et al.**, Id., Abstract.} **Therefore**, it would have been obvious to a person having ordinary skill in the art at the time the invention was made to modify the procedure of the **Admitted prior art** by including therein a random or predetermined fashion or order permutation method as taught by **Azuma et al.**, because such modification would provide the procedure disclosed in the **Admitted prior art** with a technique whereby the “[The] decimated signal sequence (signal vector) $Y_{sup.i}$ ’ ($Z_{sup.16}$) is permuted by a multiplication by the permutation matrix $[T]$ of 8.times.8. In this

Art Unit: 2133

case, the row element of the permutation matrix is 0 or 1 (the sum being 1), and element of this matrix is 0 or 1 (the sum being 1). The permutation matrix is a fixed permutation if constant with time, and a variable permutation if variable. In the scramble processing, the rows of this matrix are permuted at random, and the number of combinations is usually $n!$ for an n -times n matrix." {See Azuma et al., col. 10 line 59-et seq.}

2.3 Claims 1, 2, 3, 10, 17-24, 31-32, 35-36, 43, 46 and 49 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Applicants' Admitted prior art** (hereinafter **Admitted prior art**) in view of **Yamaguchi et al.** ("Turbo Code", a new coding system approaching theoretical Shannon limits, is born in France; NIKKEI ELECTRONICS, July 13, 1988).

As per **Claims 1, 2, 3, 10, 17-24, 31-32, 35-36, 43, 46 and 49, Admitted prior art** substantially discloses the procedure for the claimed interleaving means (or reverse operation) comprising the steps of: arranging data to be transmitted in a matrix; and rearranging or spreading by interchanging rows of the matrix according to a predetermined order, each row representing a set of data pieces of said data and rearranging or spreading by interchanging columns of the matrix according to a predetermined order, each column representing a set of data pieces of said data; and outputting said rearranged data in time series. {See **Admitted prior art**, Figs. 22-24, and page 1 line 17 – page 8 line 5, in passim, wherein rearranging or spreading means are described, e.g. data is acquired, stored or arranged in matrix or array form, subsequently permuted or spread row or column-wise in a random or predetermined fashion or order (Examiner notes that even though the data interleaving is effected in a random fashion, said predetermined fashion or order interleaving is known by the de-interleaver, de-interleaver that will use such knowledge to operate on interleaved data so as to recover the original data. Therefore, there is a predetermination in the order in which the interleaver arranges the original data.), and said permutation or interleaving operation being timed or synchronized via a clock; means to reverse data ordering (de-interleaving or de-spreading) to recover said data; and control

Art Unit: 2133

means to perform data shuffling and re-ordering; means to perform error detection and correction (page 3 line 25); means for data communication or transmission via radio or antenna means (page 1 line 17).} **Not specifically described** in detail in **Admitted prior art** is the step whereby random or predetermined fashion or order of rearranging data by columns or rows is performed in time series or sequentially.

However such approach is well known. For example, **Yamaguchi et al.**, in an analogous art, discloses algorithms wherein such techniques are described. {See **Yamaguchi et al.**, Id., Excerpt translation : page 1 first and second paras. last line.} **Therefore**, it would have been obvious to a person having ordinary skill in the art at the time the invention was made to modify the procedure of the **Admitted prior art** by including therein a random or predetermined fashion or order permutation method as taught by **Yamaguchi et al.**, because such modification would provide the procedure disclosed in the **Admitted prior art** with a technique whereby it is possible to *greatly change the characteristics of the turbo codes*, or *to improve weight distribution of said codes* {See **Yamaguchi et al.**, Excerpt translation : page 1 last para first sentence.}

2.4 Claims 1, 2, 3, 10, 17-24, 31-32, 35-36, 43, 46 and 49 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Applicants' Admitted prior art** (hereinafter **Admitted prior art**) in view of **Karasawa et al.** (US Patent No. 5,204,981; Mar. 1, 1991).

As per Claims 1, 2, 3, 10, 17-24, 31-32, 35-36, 43, 46 and 49, Admitted prior art substantially discloses the procedure for the claimed interleaving means (or reverse operation) comprising the steps of: arranging data to be transmitted in a matrix; and rearranging or spreading by interchanging rows of the matrix according to a predetermined order, each row representing a set of data pieces of said data and rearranging or spreading by interchanging columns of the matrix according to a predetermined order, each column representing a set of data pieces of said data; and outputting said rearranged data in time series. {See **Admitted prior art**,

Art Unit: 2133

Figs. 22-24, and page 1 line 17 – page 8 line 5, in passim, wherein rearranging or spreading means are described, e.g. data is acquired, stored or arranged in matrix or array form, subsequently permuted or spread row or column-wise in a random or predetermined fashion or order (Examiner notes that even though the data interleaving is effected in a random fashion, said predetermined fashion or order interleaving is known by the de-interleaver, de-interleaver that will use such knowledge to operate on interleaved data so as to recover the original data. Therefore, there is a predetermination in the order in which the interleaver arranges the original data.), and said permutation or interleaving operation being timed or synchronized via a clock; means to reverse data ordering (de-interleaving or de-spreading) to recover said data; and control means to perform data shuffling and re-ordering; means to perform error detection and correction (page 3 line 25); means for data communication or transmission via radio or antenna means (page 1 line 17).} **Not specifically described** in detail in **Admitted prior art** is the step whereby random or predetermined fashion or order of rearranging data by columns or rows is performed in time series or sequentially.

However such approach is well known. For example, **Karasawa et al.**, in an analogous art, discloses algorithms wherein such techniques are described. {See **Karasawa et al.**, Id., Fig. 9 and Abstract: last line.} **Therefore**, it would have been obvious to a person having ordinary skill in the art at the time the invention was made to modify the procedure of the **Admitted prior art** by including therein a permutation method as taught by **Karasawa et al.**, because such modification would provide the procedure disclosed in the **Admitted prior art** with a technique whereby it is possible to design “*An interleaver 10 which stores a fixed amount of signal sequence output from the FEC coder 9 and outputs it in a time series different from that of the input. That is, the interleaver 10 stores a fixed amount of data in a predetermined two-*

Art Unit: 2133

dimensional memory and provides the output, for example, in a column order if the input was applied in a row order.” {See Karasawa et al., col. 3 lines 5-et seq.}

2.5 Claims 1, 2, 3, 10, 17-20, 23-24, 31-32, 35-36, 43, 46 and 49 are rejected under 35 U.S.C. 103(a) as being unpatentable **Karasawa et al.** (US Patent No. 5,204,981; Mar. 1, 1991) in view of **Yamaguchi et al.** (“Turbo Code”, a new coding system approaching theoretical Shannon limits, is born in France; NIKKEI ELECTRONICS, July 13, 1988) in further view of **de Almeida et al.** (Two-Dimensional Interleaving Using the Set Partitioning Technique; IEEE, Aug. 1994).

As per Claims 1, 2, 3, 10, 17-20, 23-24, 31-32, 35-36, 43, 46 and 49, **Karasawa** substantially discloses the procedure for the claimed interleaving means (or reverse operation) comprising the steps of: arranging data to be transmitted in a matrix; and rearranging or spreading by interchanging rows of the matrix according to a predetermined order, each row representing a set of data pieces of said data and rearranging or spreading by interchanging columns of the matrix according to a predetermined order, each column representing a set of data pieces of said data; and outputting said rearranged data in time series. {See **Karasawa** , Fig. 9, Abstract: last line and col. 3 lines 5-et esq., in passim, wherein apparatus and method are described, e.g. data is acquired, stored or arranged in matrix or array form, subsequently permuted row or column-wise in a some fashion, and said permutation or interleaving operation being timed or synchronized via a clock; means to reverse data ordering (de-interleaving) to recover said data; and control means to perform data shuffling and re-ordering.} **Not specifically described** in detail in **Karasawa** is the step whereby random rearranging by either columns or rows of data is effected.

However such approach is well known. For example, **Yamaguchi et al.**, in an analogous art, discloses algorithms wherein such techniques are described. {See **Yamaguchi et al.**, Id., Excerpt translation : page 1 first and second paras. last line.} **Therefore**, it would have been obvious to a person having ordinary skill in the art at the time the invention was made to modify

Art Unit: 2133

the procedure of **Karasawa** by including therein a random permutation method as taught by **Yamaguchi et al.**, because such modification would provide the procedure disclosed in **Karasawa** with a technique whereby it is possible to *greatly change the characteristics of the turbo codes*, or *to improve weight distribution of said codes* {See **Yamaguchi et al.**, Excerpt translation: page 1 last para first sentence.}

While **Karasawa** and **Yamaguchi et al** substantially disclose the procedure for the claimed invention, **they fail to specifically describe** in detail the concept whereby random rearrangement of data is effected by exchanging data units at least between rows and columns.

However, such technique is well known in data processing systems, e.g., **de Almeida et al.**, in an analogous art, discloses an algorithm wherein such random rearrangement means is depicted. {See **de Almeida et al.**, Id., Example 1, Fig.1 and Table 1.}

Therefore, it would have been obvious to a person having ordinary skill in the art at the time the invention was made to modify the procedure of **Karasawa** and **Yamaguchi et al** by including therein the technique as disclosed by **de Almeida et al.** because such modification would provide the procedure of **Karasawa** and **Yamaguchi et al** with a method whereby "*simple random-error-correcting codes can be used to correct clusters of errors, instead of the more complex burst-error-correcting codes.*" {See **de Almeida et al. Id.**, SUMMARY: para. 1 last sentence, and col. 1 penultimate para.}

2.6 Claims 1, 2, 3, 10, 17-20, 23-24, 31-32, 35-36, 43, 46 and 49 are rejected under 35 U.S.C. 103(a) as being unpatentable **Karasawa et al.** (US Patent No. 5,204,981; Mar. 1, 1991) in view of **Azuma et al.** (US Patent No. 4959863; June 2, 1988) in further view of **de Almeida et al.** (Two-Dimensional Interleaving Using the Set Partitioning Technique; IEEE, Aug. 1994).

As per **Claims 1, 2, 3, 10, 17-20, 23-24, 31-32, 35-36, 43, 46 and 49**, **Karasawa** substantially discloses the procedure for the claimed interleaving means (or reverse operation) comprising the steps of: arranging data to be transmitted in a matrix; and rearranging or

Art Unit: 2133

spreading by interchanging rows of the matrix according to a predetermined order, each row representing a set of data pieces of said data and rearranging or spreading by interchanging columns of the matrix according to a predetermined order, each column representing a set of data pieces of said data; and outputting said rearranged data in time series. {See **Karasawa**, Fig. 9, Abstract: last line and col. 3 lines 5-et esq., in passim, wherein apparatus and method are described, e.g. data is acquired, stored or arranged in matrix or array form, subsequently permuted row or column-wise in a some fashion, and said permutation or interleaving operation being timed or synchronized via a clock; means to reverse data ordering (de-interleaving) to recover said data; and control means to perform data shuffling and re-ordering.} **Not specifically described** in detail in **Karasawa** is the step whereby random or variable rearranging by either columns or rows of data is effected.

However such approach is well known. For example, **Azuma et al.**, in an analogous art, discloses algorithms wherein such techniques are described. {See **Azuma et al.**, Id., Abstract.} **Therefore**, it would have been obvious to a person having ordinary skill in the art at the time the invention was made to modify the procedure of **Karasawa** by including therein a mathematical method as taught by **Azuma et al.**, because such modification would provide the procedure disclosed in **Karasawa** with a technique whereby the “[The] decimated signal sequence (signal vector) $Y_{sup.i}$ ($Z_{sup.16}$) is permuted by a multiplication by the permutation matrix $[T]$ of 8.times.8. In this case, the row element of the permutation matrix is 0 or 1 (the sum being 1), and element of this matrix is 0 or 1 (the sum being 1). The permutation matrix is a fixed permutation if constant with time, and a variable permutation if variable. In the scramble processing, the rows of this matrix are permuted at random, and the number of combinations is usually $n!$ for an n .times. n matrix.” {See **Azuma et al.**, col. 10 line 59-et seq.}

Art Unit: 2133

While **Karasawa and Azuma et al** substantially disclose the procedure for the claimed invention, **they fail to specifically describe** in detail the concept whereby random rearrangement of data is effected by exchanging data units at least between rows and columns.

However, such technique is well known in data processing systems, e.g., **de Almeida et al.**, in an analogous art, discloses an algorithm wherein such random rearrangement means is depicted. {See **de Almeida et al.**, Id., Example 1, Fig.1 and Table 1.}

Therefore, it would have been obvious to a person having ordinary skill in the art at the time the invention was made to modify the procedure of **Karasawa and Azuma et al** by including therein the technique as disclosed by **de Almeida et al.** because such modification would provide the procedure of **Karasawa and Azuma et al** with a method whereby " *simple random-error-correcting codes can be used to correct clusters of errors, instead of the more complex burst-error-correcting codes.* " {See **de Almeida et al. Id.**, SUMMARY: para. 1 last sentence, and col. 1 penultimate para.}

Conclusion

3. The prior art made of record and relied upon is considered to applicant's disclosure.

3.0 This action is non-final because the new rejection under 101 is not due to Applicant's amendment.

3.1 Any response to this action should be mailed to:

Commissioner of Patents and Trademarks, Washington, D.C. 20231

or faxed to:

(703) 746-7238, (for After-Final communications),

(703) 746-7239, (for formal communications intended for entry),

(703) 746-5463 (for informal or draft communications, please label "PROPOSED" or "DRAFT").

Art Unit: 2133

Hand-delivered responses should be brought to Crystal Park II, 2121 Crystal Drive, Arlington, VA, Fourth Floor (Receptionist).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Guy J. Lamarre, P.E., whose telephone number is (703) 305-0755. The examiner can normally be reached on Monday to Friday from 9:30 AM to 6:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Albert De Cady, can be reached on (703) 305-9595.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Group receptionist whose telephone number is (703) 305-3900.

Guy J. Lamarre, P.E.



Patent Examiner

7/11/03
